ATTACHMENT #18
FILTER SYSTEMS

18.1 BACKGROUND

The filter system consists of highly efficient units designed to remove particulates contaminated with agent, and chemical agents in aerosol, and gaseous form. The basic design of each of the filter units is an adaptation of filter units that are used in the nuclear power industry. The primary component of the filter units that remove the toxic chemical agent is the activated carbon adsorption filter. All of the CAMDS filter units employ a standard tray-type carbon adsorption filter unit that is also used in the nuclear power industry.

18.2 DESCRIPTION

The CAMDS filter units are comprised of the following major components:

- Housing
- Pre-Filter
- High Efficiency Particulate Air (HEPA) Filter
- Activated Carbon (Charcoal) Trays
- Fan
- Associated Instrumentation

The housing is designed to provide structural rigidity and leak tightness.

Within the housing of each filtration unit is a pre-filter that removes most of the large particles from the air passing through the unit. The air then passes through a High Efficiency Particulate Air (HEPA) filter that removes smaller particles. Next, the air passes through one or more banks of activated charcoal filters that adsorb any agent vapors. Then the air passes through a second bank of HEPA filters, into the fan, then through the stack to the atmosphere.

The filters that adsorb the agent vapors consist of granules of activated carbon in metal trays. The metal surfaces of the trays that are perpendicular to the airflow are perforated so the air flows through the perforations and comes in contact with the activated carbon granules. Each tray in the bank is fitted with a gasket and secured to the frame with multiple bolts to provide a leak-proof assembly through the activated carbon filter bank (all of the air must pass through the activated carbon.) Airflow through each filter unit is provided by a centrifugal fan. The largest filter units have 100 horsepower electric fan motors and move up to 16,000 CFM of air. Each filter unit is equipped with differential pressure sensors to measure the pressure drop across each bank of pre-filters and HEPA filters and across the entire filter housing. A change in the pressure differential between the inlet and outlet of a pre-filter or HEPA filter bank is a good indicator of the condition of the filters, so the pressure differential readings are monitored during operation of the filter unit to assure that the banks are not clogged and are functioning properly. Airflow through the filter system is controlled by dampers within the ducts or by motor speed controllers on the filter fan motors.

18.3 MONITORING FILTER BANKS FOR AGENT

The HVAC carbon adsorption filter units shall be continuously monitored for agent breakthrough by DAAMS at the mid-bed and exhaust stack for both the six-bank and the Laboratory (two bank) filter systems. NRT monitors shall also monitor exhaust stacks of both filter units.

CAMDS' six-bank HVAC filter system is the main ventilation manifold and the system has filter units No. 9, 10, 19, 20, 21, 22). The six banks of carbon and are monitored for agent after the first, the second and the fourth banks and at the exhaust stack.

The six-bank, CAMDS site HVAC filter mid-bed locations (after banks one, two, and four) and filter exhaust stack shall be monitored continuously with DAAMS for Mustard, GB, and VX at the WPL (12 hour), and for any other agents that could have contaminated the carbon banks based upon CAMDS knowledge of agent types treated at the facility and filter unit exposure history. NRT monitors shall be used to monitor the filter exhaust stack for each agent being processed in the plant at the STEL (action level 0.50 Z).

The CAMDS laboratory two-bank HVAC filter units (No. 5, 6, 7, 12), which could potentially be exposed to agents in very small amounts and for short durations, have two banks of carbon. The two-bank, CAMDS laboratory HVAC filters shall be continuously monitored at the mid-bed (between carbon banks 1 and 2) and exhaust stack with DAAMS for GB, GA, Lewisite, Mustard, and VX at the WPL (12 hour). NRT monitors shall monitor the two-bank filter exhaust stack for GB and VX at the STEL (action level 0.50 Z).

18.4 FILTER SHUT-DOWN FOR CHANGE OUT OF A CARBON BANK

Shut-down of a filter for change-out of a carbon bank involves closing the damper at the outlet of the filter unit, leaving the damper at the inlet of the filter unit at least partly open and shutting down the filter fan. This results in a negative pressure relative to atmospheric pressure within the filter unit during change-out.

When change-out of a carbon bank is required, all carbon trays in that bank are changed at the same time. Only the carbon filter banks that could have been contaminated in the filter housing are changed out. Within thirty (30) days after agent break through is confirmed at or above the 1 WPL level at the mid-bed location after the second bank of carbon of a six bank carbon filter unit or after the first bank of a two carbon bank filter unit, carbon change-out operations will begin or the filter will be placed off-line until carbon is changed.

Confirmed agent detection (greater than or equal to 1 WPL) after the second bank of a six bank filter will require that the first two carbon banks are changed out; the third bank will either be changed out or its carbon will be moved to the number one position. Confirmed agent detection (greater than or equal to 1 WPL) after the first bank of a two-bank filter unit will require that both carbon banks are changed out.

Confirmed detection of agent at above the 1 STEL level in the exhaust stack of any filter unit will require that the filter unit is immediately shutdown and airflow redirected to a backup filter unit. If a backup filter is not available, CAMDS will stop operations in all affected areas until both primary and backup filter systems are available.

If agent breakthrough is detected and confirmed greater or equal to 1 WPL downstream of the fourth bank of carbon, the filter unit will be shut down, air flow will be immediately redirected to a backup filter system and all trays of all banks of carbon will be replaced.

18.5 MANAGEMENT OF SPENT CARBON

Spent carbon is put into steel drums and stored as hazardous waste.

18.6 VENTILATION INSPECTION

The following items are inspected daily.

- The ventilation system is visually inspected for evidence of corrosion or malfunctions.
- The filters are checked for pressure drop.
- The airflow is checked.
- The filters are visually inspected for evidence of excessive wear.
- The chemical agent monitors are visually inspected to ensure that required monitors are present and operational.

Internal mechanical systems are checked when filter banks are changed.

Clamp and gasket inspections will be conducted annually, at a minimum.

18.7 DESCRIPTION OF FILTER SYSTEMS

All filters are type II and use carbon trays.

18.8 TEST METHODS

Initial acceptance of a new filter unit for use in filtering air contaminated with agent during CAMDS operations and similar acceptance of an existing filter unit that has had activated carbon changed or added is achieved by "challenging" the banks of the filter. Each CAMDS filter unit is also challenged every eighteen (18) months.

A challenge consists of injecting a tracer leak gas (such as Freon) upstream of the bank being tested and sensing the concentration of tracer leak test gas both upstream and downstream of the filter bank. Sensitive tracer gas leak detection equipment can establish if tracer gas immediately leaks through the filter bank assembly and the concentrations of the tracer leak gas both up stream and down stream of the carbon absorption filter bank being challenged.